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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/708,664

03/18/2004

Min-Lung Huang

10545-US-PA

2663

31561

7590

10/19/2006

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE

7 FLOOR-1, NO. 100

ROOSEVELT ROAD, SECTION 2

TAIPEI, 100

TAIWAN

EXAMINER

GRAYBILL, DAVID E

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 10/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/708,664

Applicant(s)

HUANG ET AL.

Examiner

David E. Graybill

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-6,8-13 and 15-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-6,8-13 and 15-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                      |                                                                   |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____                                                          | 6) <input type="checkbox"/> Other: _____                          |

The amendment to the claims filed on 7-27-6 does not comply with the requirements of 37 CFR 1.121(c) because the amendment is not marked-up relative to the previously unentered amendment after final filed on 7-3-6, now entered. Amendments to the claims filed on or after July 30, 2003 must comply with 37 CFR 1.121(c) which states:

(c) *Claims.* Amendments to a claim must be made by rewriting the entire claim with all changes (*e.g.*, additions and deletions) as indicated in this subsection, except when the claim is being canceled. Each amendment document that includes a change to an existing claim, cancellation of an existing claim or addition of a new claim, must include a complete listing of all claims ever presented, including the text of all pending and withdrawn claims, in the application. The claim listing, including the text of the claims, in the amendment document will serve to replace all prior versions of the claims, in the application. In the claim listing, the status of every claim must be indicated after its claim number by using one of the following identifiers in a parenthetical expression: (Original), (Currently amended), (Canceled), (Withdrawn), (Previously presented), (New), and (Not entered).

(1) *Claim listing.* All of the claims presented in a claim listing shall be presented in ascending numerical order. Consecutive claims having the same status of "canceled" or "not entered" may be aggregated into one statement (*e.g.*, Claims 1-5 (canceled)). The claim listing shall commence on a separate sheet of the amendment document and the sheet(s) that contain the text of any part of the claims shall not contain any other part of the amendment.

(2) *When claim text with markings is required.* All claims being currently amended in an amendment paper shall be presented in the claim listing, indicate a status of "currently amended," and be submitted with markings to indicate the changes that have been made relative to the immediate prior version of the claims. The text of any added subject matter must be shown by underlining the added text. The text of any deleted matter must be shown by strike-through except that double brackets placed before and after the deleted characters may be used to show deletion of five or fewer consecutive characters. The text of any deleted subject matter must be shown by being placed within double brackets if strike-through cannot be easily perceived. Only claims having the status of "currently amended," or "withdrawn" if also being amended, shall include markings. If a withdrawn claim is currently amended, its status in the claim listing may be identified as "withdrawn—currently amended."

*(3) When claim text in clean version is required.*

The text of all pending claims not being currently amended shall be presented in the claim listing in clean version, *i.e.*, without any markings in the presentation of text. The presentation of a clean version of any claim having the status of "original," "withdrawn" or "previously presented" will constitute an assertion that it has not been changed relative to the immediate prior version, except to omit markings that may have been present in the immediate prior version of the claims of the status of "withdrawn" or "previously presented." Any claim added by amendment must be indicated with the status of "new" and presented in clean version, *i.e.*, without any underlining.

*(4) When claim text shall not be presented;  
canceling a claim.*

(i) No claim text shall be presented for any claim in the claim listing with the status of "canceled" or "not entered."

(ii) Cancellation of a claim shall be effected by an instruction to cancel a particular claim number. Identifying the status of a claim in the claim listing as "canceled" will constitute an instruction to cancel the claim.

*(5) Reinstatement of previously canceled claim.* A claim which was previously canceled may be reinstated only by adding the claim as a "new" claim with a new claim number.

Also, MPEP 706(h)IIID instructs:

If the conditions for filing an RCE have been satisfied, the technical support personnel will process the proper RCE. Any previously filed unentered amendments, >and< amendments filed with the RCE \*\* will normally be entered. \*>Such< amendments \*\*>will be< entered in the order in which they were filed in the absence of any specific instructions for entry. For example, if applicant files an amendment after final rejection which is denied entry by the examiner and applicant subsequently files an RCE with an amendment but the RCE is silent as to whether or not the previously filed after-final amendment should be entered, then the Office will enter both amendments in the order in which they were filed. If, however, applicant files an amendment after final rejection which is denied entry by the examiner and applicant subsequently files an RCE with an amendment including specific instructions that the previously filed after-final amendment is not to be entered, then the Office will enter the amendment filed with the RCE but will not enter the after-final amendment. If conflicting amendments have been previously filed, applicant should clarify which amendments should be entered upon filing the RCE (and fee).

This is emphasized on the RCE form PTO/SB/30:

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

Because the response appears to be bona fide, but through an apparent oversight or inadvertence the response is non-compliant, and in order to continue to afford applicant the benefit of compact prosecution, the requirement to comply with the response within a one month time limit is waived, the amendment is entered, and the claims are examined on the merits.

The reply filed on 7-27-6 is not fully responsive to the prior Office action because it fails to conform to the provisions of MPEP 714.03:

37 CFR 1.111. Reply by applicant or patent owner to a non-final Office action.

(b) In order to be entitled to reconsideration or further examination, the applicant or patent owner must reply to the Office action. The reply by the applicant or patent owner must be reduced to a writing which distinctly and specifically points out the supposed errors in the examiner's action and must reply to every ground of objection and rejection in the prior Office action. The reply must present arguments pointing out the specific distinctions believed to render the claims, including any newly presented claims, patentable over any applied references. If the reply is with respect to an application, a request may be made that objections or requirements as to form not necessary to further consideration of the claims be held in abeyance until allowable subject matter is indicated. The applicant's or patent owner's reply must appear throughout to be a bona fide attempt to advance the application or the reexamination proceeding to final action. A general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references does not comply with the requirements of this section.

(c) In amending in reply to a rejection of claims in an application or patent under reexamination, the applicant or patent owner must clearly point out the patentable novelty which he or she thinks the claims present in view of the state

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of the art disclosed by the references cited or the objections made. The applicant or patent owner must also show how the amendments avoid such references or objections.

Where a bona fide response to an examiner's action is filed before the expiration of a permissible period, but through an apparent oversight or inadvertence some point necessary to a complete response has been omitted - such as an amendment or argument as to one or two of several claims involved or signature to the amendment - the examiner, as soon as he or she notes the omission, should require the applicant to complete his or her response within a specified time limit (usually one month) if the period for response has already expired or insufficient time is left to take action before the expiration of the period. If this is done the application should not be held abandoned even though the prescribed period has expired.

Specifically, the 35 U.S.C. 112 rejection of claims 1-6, 8-13 and 15-17 for the claims 1 and 8 language "the wetting-barrier layer only covers an upper surface of the barrier layer" has not been addressed.

Because the response appears to be bona fide, but through an apparent oversight or inadvertence the response is incomplete, and in order to continue to afford applicant the benefit of compact prosecution, the requirement to complete the response within a one month time limit is waived, the amendment is entered, and the claims are examined on the merits.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-6, 8-13 and 15-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The undescribed subject matter is the claims 1 and 8 negative limitation "the wetting-barrier layer only covers an upper surface of the barrier layer." Any negative limitation or exclusionary proviso must have basis in the original disclosure. See *Ex parte Grasselli*, 231 USPQ 393 (Bd. App. 1983) *aff'd mem.*, 738 F.2d 453 (Fed. Cir. 1984). The mere absence of a positive recitation or drawing illustration is not basis for an exclusion. To this end, it is noted that this rejection might be overcome if the negative limitation is restated using positive terminology. Indeed, applicant discloses that the wetting-barrier layer more than only covers an upper surface of the barrier layer; for example, applicant discloses that the wetting barrier layer also covers the adhesion layer.

In the rejections *infra*, generally, reference labels are recited only for the first recitation of identical claim elements.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-6, 8-13 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung (20030222352).

At paragraphs 13, 25 and 26, Kung discloses the following:

An under bump metallurgy layer, between a bonding pad 16 of a chip 10 and a bump 18, for improving adhesion between the bonding pad and the bump, comprising: an adhesion layer 212, disposed on the bonding pad; a barrier layer 214, disposed on the adhesion layer; and a wetting-barrier layer 216, disposed on the barrier layer and between the barrier layer and the bump, wherein a material of the bump comprises tin, and wherein a material of the wetting-barrier layer is made of nickel, wherein the wetting-barrier layer has a thickness larger than that of the adhesion layer or that of the barrier layer, and the bump is disposed on the wetting-barrier layer and



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the wetting-barrier layer only covers an upper surface of the barrier layer; wherein a material of the adhesion layer is selected from the following group consisting of titanium (Ti), titanium-tungsten (Ti-W) alloy, chromium (Cr), titanium nitride (TiN), tantalum nitride (TaN), tantalum (Ta), aluminum (Al) and copper (Cu); wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and aluminum, and the bonding pad is made of aluminum; wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and copper, and the bonding pad is made of copper; wherein a material of the barrier layer comprises nickel-vanadium alloy; wherein the under bump metallurgy layer further comprises an inherently anti-oxidation layer 220 and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump.

A flip chip structure, comprising: a chip having an active surface, a passivation layer 14 and a plurality of bonding pads, wherein the bonding pads are disposed on the active surface and the passivation layer are disposed on the active surface exposing the bonding pads; an under bump metallurgy layer, wherein the under bump metallurgy layer comprising: an adhesion layer, disposed on the bonding pad; a barrier layer, disposed on

the adhesion layer; and a wetting-barrier layer, disposed on the barrier layer, wherein a material of the wetting-barrier layer is nickel, and the wetting-barrier layer has a thickness larger than that of the adhesion layer or that of the barrier layer, and wherein the wetting-barrier layer only covers an upper surface of the barrier layer; and a bump, disposed on the wetting barrier layer; wherein a material of the adhesion layer is selected from the following group consisting of titanium (Ti), titanium-tungsten (Ti-W) alloy, chromium (Cr), titanium nitride (TiN), tantalum nitride (TaN), tantalum (Ta), aluminum (Al) and copper (Cu); wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and aluminum, and the bonding pad is made of aluminum; wherein a material of the adhesion layer is selected from the following group consisting of titanium, titanium-tungsten alloy, chromium, titanium nitride, tantalum nitride, tantalum and copper, and the bonding pad is made of copper; wherein a material of the barrier layer comprises nickel-vanadium alloy; wherein the under bump metallurgy layer further comprises an anti-oxidation layer and the anti-oxidation layer is disposed between the wetting-barrier layer and the bump; wherein a material of the bump is made of tin-silver-copper alloy; wherein a material of the bump is made of tin-copper alloy; wherein a material of the bump is tin.

However, Kung does not appear to explicitly disclose wherein the wetting-barrier layer has a thickness larger than that of the adhesion layer or that of the barrier layer. Nevertheless, as reasoned from well established legal precedent, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that, in view of the applied prior art, the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

In the alternative, claims 1-6, 8-13 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung as applied to claims 1-6, 8-13 and 15-17 supra, and further in combination with Lee (20020121692).

Kung does not appear to explicitly disclose wherein the wetting-barrier layer has a thickness larger than that of the adhesion layer or that of the barrier layer. Regardless, at paragraphs 13-19, Lee discloses wherein the inherently wetting-barrier layer 20 has a thickness larger than that of the adhesion layer 18. Moreover, it would have been obvious to combine this disclosure of Lee with the disclosure of Kung because, as disclosed by Kung as cited, it would provide a large standoff and improved thermal performance.

To further clarify, Lee discloses an inherently wetting-barrier layer 20 because, as cited, Lee discloses "the solder 22 is melted . . . creating the spherically shaped interconnect bump 22 that is shown in FIG. 4," and, in FIG. 4, 22 is depicted wetting layer 20. Furthermore, in Fig. 4, layer 20 is depicted as something material that blocks passage of 22.

Applicant's amendment and remarks filed 7-27-6 have been fully considered, are adequately treated supra, and are further addressed infra.

Applicant asserts, "With respect to independent claims 1 and 8, the wetting-barrier layer is specifically defined as a nickel while the bump includes the tin material." "This has been non-obvious and rendered unexpected results when considering the present invention as a whole."

This assertion is respectfully traversed because the scope of claims 1 and 8 is not limited to wherein the wetting-barrier layer is specifically

defined as a nickel while the bump includes the tin material. Specifically, the scope of claims 1 and 8 are limited to "wherein a material of the wetting-barrier layer is made of nickel," and the scope of this limitation, unlike the scope of the language, *the wetting-barrier layer is specifically defined as a nickel*, encompasses wherein the wetting-barrier layer comprises a material in addition to nickel. Moreover, the scope of claim 8 is not limited to wherein the bump includes the tin material. Furthermore, unexpected results and criticality cannot be relied on to overcome a rejection based on anticipation. Specifically, Lee anticipates the instant claimed thicknesses; therefore, Lee inherently teaches the alleged unexpected results and criticality. Furthermore, applicant originally disclosed and presently discloses (see, for example, the abstract and the claims), and originally claimed, an embodiment of the invention not limited to the allegedly critical limitation having unexpected results. And, and as indicated in MPEP 2164.089(c), "Broad language in the disclosure, including the abstract, omitting an allegedly critical feature having unexpected results, tends to rebut the arguments of unexpected results and criticality." In any case, it is respectfully submitted that unexpected results and criticality must be established by factual evidence, and not, as here, by mere argument. See, for example, *In re De Blauwe*, 736 F.2d 699, 222 USPQ 191, 196 (Fed. Cir. 1984), and MPEP 716.02(d), "Demonstrating Criticality of a Claimed Range."

To establish unexpected results over a claimed range, applicants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. In re Hill, 284 F.2d 955, 128 USPQ 197 (CCPA 1960). To this end, the arguments of counsel cannot take the place of evidence in the record. In re Schulze, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965). Instead, the evidence relied on should establish "that the differences in results are in fact unexpected and unobvious and of both statistical and practical significance." Ex parte Gelles, 22 USPQ2d 1318, 1319 (Bd. Pat. App. & Inter. 1992). See also, Ex parte C, 27 USPQ2d 1492 (Bd. Pat. App. & Inter. 1992); In re Nolan, 553 F.2d 1261, 193 USPQ 641, 645 (CCPA 1977); and In re Eli Lilly, 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990).

Also, applicant contends, "in the present invention, the wettable layer 106 should use the nickel but not the copper or gold. Kung fails to specifically choose the nickel as the wettable layer."

This contention is respectfully traversed because the scope of the instant claims is not limited to wherein the wettable layer 106 should use the nickel but not the copper or to specifically choose the nickel as the wettable layer, and the prior art is not necessarily applied to the rejection for these disclosures. In addition, as elucidated in the rejection, Kung discloses "wherein a material of the wetting-barrier layer is made of nickel."

In addition, applicant alleges, "with respect to claims 6 and 13, Kung in [0007] states that the oxidation resistant layer is made if the wettable layer is made from copper. This apparently discloses that the oxidation resistant layer is not made when the wettable layer is made from nickel. This is different from the present invention."

This allegation is respectfully traversed because Kung does not disclose that the oxidation resistant layer is not made when the wettable layer is made from nickel.

Applicant also suggests, "In re Lee [sic], the metal layer 20 is used in the electroplating process so that the final layer 22 of solder is electroplated on the surface of the layer 20. Apparently, the layer 20 is not used to server [sic] as a wetting-barrier layer of the present invention."

This suggestion is respectfully deemed unpersuasive because it is a non-sequitur.

**For information on the status of this application applicant should check PAIR:**

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**Alternatively, applicant may contact the File Information Unit at (703) 308-2733. Telephone status inquiries should not be directed to the examiner. See MPEP 1730VIC, MPEP 203.08 and MPEP 102.**

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Any other telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (571) 272-1930. Regular office hours:

Monday through Friday, 8:30 a.m. to 6:00 p.m.

The fax phone number for group 2800 is (571) 273-8300.



David E. Graybill  
Primary Examiner  
Art Unit 2822

D.G.

13-Oct-06